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Dithyrocaris sp. (Phyllocarida) from the Allegheny Group of Ohio

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Abstract. Two phyllocarid carapaces and a phyllocarid tail collected from the Pennsylvanian Washingtonville Shale of Ohio are described and compared with known phyllocarid species. Not enough material was available to identify these specimens with a known species or to describe a new species, but the specimens are significant in documenting variation in the genus.

Introduction

Michael C. Hansen of the Ohio Division of Geological Survey called to my attention two *Dithyrocaris* carapaces collected by Lloyd J. Millhorn in the Washingtonville Shale and given to Myron Sturgeon of Ohio University, Athens, Ohio. A further search of the collections at Ohio University yielded a tail collected by Sturgeon at a different locality within the same unit. These 3 specimens from the Pennsylvanian Washingtonville Shale are not preserved well enough to identify satisfactorily with any known species or to describe as a new species. Although *Dithyrocaris* species are fairly common in Europe, there are so few in North America that any new material warrants description in the literature.

Dithyrocaris is fairly well known from the Devonian and Carboniferous of Europe. Jones and Woodward (1888–1899) wrote the definitive treatise incorporating all the European and North American specimens known at that time. Essentially no further work was done until Rolfe (1969) in the Treatise on Invertebrate Paleontology undertook a preliminary revision of the various phyllocarid taxa. The result was the incorporation of several former genera into one genus, *Dithyrocaris*. Rolfe stated a necessity for further revision, adding that features separating the genera of the Rhinocarididae may only be specific characters.

The known North American Carboniferous species include *Dithyrocaris carbonaria* Meek and Worthen, 1870, and *Rhacura*? *venosa* Scudder, 1878, placed in *Dithyrocaris* by Rolfe (1969). These species are based on specimens of tails, and neither is well known. Copeland (1967) described *Dithyrocaris quinni* from the Mississippian of Arkansas, based on carapaces and tails; and Schram and Horner (1978) described *Dithyrocaris rolfei,* an intact animal, from the Upper Mississippian of Montana.

Because the material from Ohio is fragmentary, and because the taxonomy of the group is confused, it seems better to designate these two carapaces and tail as *Dithyrocaris* sp. rather than erect new species which would only serve to further confound the situation. More and better material and/or a revision of the entire genus might permit a specific designation some day.

OSU 33450 (Fig. 1, upper and lower right) and OSU 33451, two carapaces, are from Ohio University locality CAr-2 (Hoare et al., 1979, p. 66) in Rose Township, Carroll County, Ohio, in the James Bros. Mining Company strip mine. The tail, OSU 33452 (Fig. 1, left), is from Ohio University locality Cc-7 (Sturgeon and Hoare, 1968, p. 80), Center Township, Columbiana County, Ohio. Both localities are in the marine horizon of the Washingtonville Shale, Allegheny Group, Pennsylvanian System. Stur-

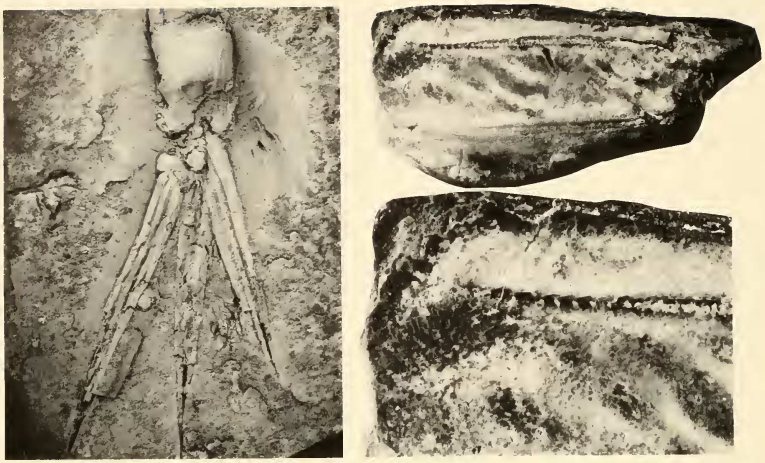

FIGURE 1. *Dithyrocaris* sp. Left. OSU 33452, the last abdominal segment showing the chevron line decoration, and telson and furca: Upper right. OSU 33450, carapace showing lateral carinae and part of the median dorsal plate: Lower right. Detail of posterodorsal corner of carapace OSU 33450, showing underlying segment with chevron line decoration, detail of juxtadorsal carina, and the "fish scale" pattern terrace lines of the carapace ornamentation.

geon and Hoare (1968) state that marine deposits of this age yield faunas often abundant in corals, bryozoans, fusilinids, arthropods, sponges, mollusks, and brachiopods. Although the Washingtonville Shale is heavily collected, Michael C. Hansen (*personal communication*) states that crustaceans of any sort are rare. These specimens are the only phyllocarids known to have been found.

The specimens are deposited in the Orton Museum of The Ohio State University, Columbus, Ohio with accession numbers OSU 33450, OSU 33451 and OSU 33452.

Discussion

The tail OSU 33452 (Fig. 1, left) is similar to those of other *Dithyrocaris* species, with a telson about equal in length to the furca, and blade-shaped with a central median ridge. OSU 33452 resembles what is known of *D. venosa* (Scudder, 1878), though it is smaller than *D. venosa*. The tail (OSU 33452) does not seem to have many characters in common with *D. carbonaria*, *D. rolfei* or *D. quinni*, the other known American Carboniferous *Dithyrocaris* species with tails. Among the European *Dithyrocaris* species, *D. colei* and *D. testudinea* (Jones and Woodward, 1888–99) most resemble the tail and last segment of OSU 33452, including shape, the chevron decoration of the last segment, and a similar pattern of ridges on the telson and furca. The chevron lines on the last segment may relate the tail to the carapace OSU 33450, which appears to have the chevron lines on the segment underlying the carapace, but with the lack of further material, especially a whole specimen, relationship is uncertain.

The carapaces (OSU 33450, 33451) resemble the American Mississippian species, *D. quinni* (Copeland, 1967). However, they are not as strongly sclerotized in appearance, nor are the strong doublure edges preserved as in *D. quinni*. *Dithyrocaris quinni* has similar prominent lateral carinae. There is no close resemblance to *D. rolfei*, the other known Carboniferous American *Dithyrocaris* (Schram and Horner, 1978).

The unique "fish scale" terrace lines (Fig. 1, lower right) resemble in pattern that of the Devonian *D. neptuni* (Stumm and Chilman, 1969). Carapace decoration is a common *Dithyrocaris* characteristic.

Comparison of these specimens with European *Dithyrocaris* species shows a similarity to the median dorsal plates of *D. paradoxides* (Rolfe, 1969) and *D. testudinea* (Jones and Woodward, 1888–99). However, the carapace shape, the relative position of the lateral carinae and the decorative pattern seem to make these specimens unique and not directly comparable to any known American or European *Dithyrocaris* species. Other features used in analysis of *Dithyrocaris* species, such as a posterolateral spine, doublure or carapace edges, and most anterodorsal features, are missing in these two specimens.

Systematic Paleontology

Phyllocarida Packard, 1879
Archaeostraca Claus, 1888
Rhinocarina Clarke *in* Zittel, 1900
Rhinocarididae Hall and Clarke, 1888
Dithyrocaris Clarke *in* Hall and Clarke, 1888

Dithyrocaris sp.
Fig. 1

Material.—OSU 33450, OSU 33451, OSU 33452.

Remarks.—Specimen OSU 33452 (Fig. 1, left) is the last abdominal segment and a nearly complete telson with furca. The fossil is in black shale and consists of some calcite remains as well as partial impression in the shale. The fossil is presumably preserved ventrally with the furcal rami lying over the telson. The last segment is ≈5.1 mm in length while the telson is 11.4 mm. The furca measure ≈11.0 mm and 11.8 mm respectively. The measurements are approximate due to the crushed and somewhat distorted state of the fossil. The telson is judged to have been about equal to the furca in length. The telson is narrow and blade-shaped with a dorsal ridge down the center, viewed as a depression in the fossil. The telson has straight sides with no convexity and ends in a sharp point. No spines or spinules are present. The furcal rami are also long and narrow, with no convexity in their shape. There is a center ridge with two lateral, less distinct ridges to each side, which curve toward the center ridge at the head of the ramus and disappear toward the narrow tip. These may reflect depressions dorsally. There are no spines or spinules apparent on the furca. The last abdominal segment has the chevron decoration common in *Dithyrocaris* species. The chevrons point posteriorly.

Specimens OSU 33450 (Fig. 1, right upper and right lower) and OSU 33451 are incomplete carapaces in black shale and are partially replaced with calcite. Both are somewhat twisted, OSU 33451 more so, and are apparently flattened laterally. None of the carapace edges, posterior, anterior, or lateral, are complete. There is a possible remnant of doublure edging laterally on OSU 33451, but it seems broken and displaced. The dorsal length measured from the anterior tip of the carapace to the posterior edge is 25.2 mm on OSU 33450 and 24.5 mm on OSU 33451. OSU 33450 has remnants on one side anteriorly of a short cephalic carina running just above the anterior portion of the mesolateral carina and ending just below the juxtadorsal carina. Anteriorly it ends at the broken edge of the carapace. The mesolateral carina runs from anterior edge to posterior edge on both specimens. The mesolateral carina is a fold line and on both specimens there are remnants of blunt very short spinules pointing posteriorly on both specimens but they are for the most part missing and broken. There are apparently pitted areas running along both sides of the mesolateral carina, more apparent on OSU 33450 than on OSU 33451. The pits are tiny and perhaps had a sensory function. A strong juxtadorsal carina begins just above the end of the cephalic carina and ends just before the posterior edge of the carapace. This carina lies near the median dorsal plate dorsally. The carina is composed of raised knobs or blunt spinules joined at their base and directed in a latero-posterior direction, similar to the spinules present on the lateral carina mentioned above. The juxtadorsal spinules are more pronounced anteriorly than posteriorly along the carina. Both specimens have a median dorsal plate or the remains

of one, which appears solid and separate from the carapace. The dorsal plate is in appearance composed of imbricating posteriorly pointed blunt chevrons. Where the dorsal plate appears to end on OSU 33450 near the anterior end of the carapace 2 rows of blunt spinules arise, point posterolaterally, and form 2 ridges which diverge slightly, run parallel to each other across the carapace and disappear at the broken anterior edge. The area between these ridges was probably the area of the rostral plate.

OSU 33450 and OSU 33451 are decorated with a "fish scale" or "terrace" pattern, which anterodorsally is composed of many fine wavy lines which become more like fish scales posterolaterally. These terraces end in an ordered fashion on either side of the juxtadorsal carina (OSU 33450, Fig. 1, lower right). OSU 33450 (Fig. 1, upper and lower right) is broken posterodorsally revealing an underlying segment with a pattern of straight lines aligned diagonally and posteriorly. This indicates that the segment underlying the carapace at this point had the chevron line decoration common in *Dithyrocaris* species and which I have seen in the pre-telson segment of the tail (OSU 33452). The "fish scale" pattern continues to the ventral broken edge of the carapace. Edges of the carapaces are not preserved. However, OSU 33451 has tiny fragmentary pieces of what may have been doublure but which is broken and displaced.

There does not appear to be a posteroventral spine, but as the posterior carapace edges are missing, absence or presence is uncertain. OSU 33450 has anteroventrally two large prominent protuberances which may be remains of large mandibles.

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